

DESTINATION DEVICE INITIATED CALLER IDENTIFICATION**CROSS-REFERENCE TO RELATED APPLICATIONS**

5

The present application is related to the following co-pending applications:

10 (1) U.S. Patent Application Serial No. ____/_____(Attorney Docket No. AUS920010818US1);

15 (2) U.S. Patent Application Serial No. ____/_____(Attorney Docket No. AUS920010819US1);

20 (3) U.S. Patent Application Serial No. ____/_____(Attorney Docket No. AUS920010821US1);

25 (4) U.S. Patent Application Serial No. ____/_____(Attorney Docket No. AUS920010822US1); and

20 (5) U.S. Patent Application Serial No. ____/_____(Attorney Docket No. AUS920010823US1).

BACKGROUND OF THE INVENTION**1. Technical Field:**

5

The present invention relates in general to telecommunications and, in particular, to voice identification. Still more particularly, the present invention relates to initiating authentication of the identity of a caller at a destination device.

2. Description of the Related Art:

Telephone service has created communication channels worldwide, and those channels continue to expand with the advent of cellular and other wireless services. A person can simply take a telephone off-hook and dial a destination number or press a send button and be connected to a telephone line around the world.

20

While telephones provide important communication abilities between people, there is also the problem of persons and businesses that intrude into one's home or workplace via the telephone. To alleviate the problem of unwanted callers, callees 25 may allow an answering machine to answer all calls and then wait for a person to say who they are when leaving a message, before answering only those calls desired by the callee. However, many phone subscribers opt for a messaging service, rather than attaching an answering machine device to a telephone line, where

the messaging service does not play a message to the caller while the message is being recorded.

Alternatively, a caller identification (caller ID) that identifies the wireline or wireless number from which a call is received, may be transferred with a call to a destination device.

In addition, the subscriber to that wireline or wireless number may be identified. However, the information given to a callee at the destination device only indicates the identity of the subscriber to a line and does not indicate the identity of the person making a call. In addition, a subscriber may now select an additional service that blocks the caller ID for a subscriber number from being transferred to a destination device.

10
11
12
13
14
15
16
17
18
19
20

Therefore, in view of the foregoing, it would be advantageous to provide a method, system, and program for identifying a caller, rather than the number for the wireline or wireless service from which a call is made. In particular, it would be advantageous for a destination device to identify the caller identity of a caller placing a call, such that the callee may decide whether to answer the call or not before speaking with the caller.

SUMMARY OF THE INVENTION

In view of the foregoing, it is therefore an object of the
5 present invention to provide an improved telecommunications
system.

It is another object of the present invention to provide a
method, system and program for improved voice identification.

It is yet another object of the present invention to provide
a method, system and program for initiating authentication of the
identity of a caller at a destination device.

According to one aspect of the present invention, in
response to detecting a call extended to a destination device,
extending a request from said destination device to an origin
device requesting a voice utterance of the caller at said origin
device. A caller identity associated with the voice utterance is
20 identified at the destination device, such that a callee
receiving the call at the destination device is informed of the
caller identity before choosing whether to speak with the caller.

All objects, features, and advantages of the present
25 invention will become apparent in the following detailed written
description.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself 5 however, as well as a preferred mode of use, further objects and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

10 **Figure 1** depicts a block diagram of a network environment in which the present invention may be implemented;

15 **Figure 2** illustrates a block diagram of the flow of a voice identifier authenticated by a destination device in accordance with the method, system, and program of the present invention;

20 **Figure 3** depicts a block diagram of the flow of a voice identifier authenticated by a third party device accessible from a destination device in accordance with the method, system, and program of the present invention;

25 **Figure 4** illustrates a flow diagram of a signal flow and processing where a destination device authenticates a caller identity in accordance with the method, system, and program of the present invention; and

Figure 5 depicts a flow diagram of a signal flow and processing where a third party system is accessed by a destination device to authenticate a caller identity in

accordance with the method, system, and program of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A method, system, and program for destination device initiated caller identification are provided. By authenticating 5 a caller identity at a destination device, the callee is enabled to decide whether to answer a call from a specific caller.

According to one advantage of the present invention, the 10 caller identity is authenticated by matching a caller spoken utterance with a voice sample stored at the destination device or a third party server. However, while voice authentication is described as the preferred method of identification, other methods of identification such as a password entry, a smart card entry, a biometric entry, or other security identification 15 entries may be utilized.

Another advantage of the destination device performing 20 caller identity authentication is that a destination device may store an address book of voice samples for preferred callers. If a caller cannot be identified within the address book of voice samples, then the a third party server of voice samples may be accessed or the caller may be prompted to provide a voice sample 25 for use in future authentication by the destination device.

While in the present invention, authentication of a caller 25 identity is described with emphasis placed on voice authentication, other methods of caller identity authentication may also be performed. Voice samples utilized for voice authentication are just one of multiple types of biometric

sampling. For example, a caller may locally provide an eye scan, a fingerprint, and other biophysical identifiers that are transmitted within or outside the trusted network to authenticate the identity of the caller. Alternatively, keypad entries, such 5 as a pin code, credit card account number, password, or other secure transaction key may be entered by a caller and utilized to authenticate the identity of the caller.

In addition, while in the present invention, authentication of a caller identity is described with emphasis upon performing authentication at the beginning of a call, authentication of a caller identity may be performed continuously throughout a call, at selected points throughout a call, and after a call. Selected points where authentication may be performed include when an additional phone pick-up is detected, when a new voice is detected at the origin device, when a call is transferred from one telephone device to another, and other routing of a call that may result in a new caller or in a call being recorded.

20 Further, while the present invention is described with emphasis upon a caller identity authentication being made for a call to continue, a call may also continue without caller identity authentication. However, where a caller is not identifiable, it may be advantageous to automatically log that 25 the caller lacks proper identification and automatically record calls that lack proper callee identification.

For purposes of the present invention, telephony devices are termed origin devices when utilized for origination of a call to

an intermediary device and are termed destination devices when utilized for receipt of a call from an intermediary device. Subscribers to a call are termed callers when originating a call and are termed callees when receiving a call. Callers and 5 callees may or may not be line subscribers to the particular telephony device utilized.

In the following description, for the purposes of explanation, numerous specific details are set forth to provide a thorough understanding of the present invention. It will be apparent, however, to one skilled in the art that the present invention may be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form to avoid unnecessarily obscuring the present invention.

With reference now to the figures, and, in particular, with reference now to **Figure 1**, there is depicted a block diagram of a network environment in which the present invention may be implemented. While the present invention is described with reference to one type of network environment, it will be understood by one with skill in the art that the present invention may be implemented in alternate types of network environments.

25

GENERAL NETWORK ENVIRONMENT

First, the network environment incorporates a Public Switching Telephone Network (PSTN) **10**. As is known in the art

the core of PSTN **10** may include multiple telephone networks, each owned by one of multiple independent service providers. Each telephone line is carried by an independent service provider within PSTN **10** and is typically assigned to at least one

5 subscriber.

Switching of a call within an independent service provider's telephone network is considered trusted movement within a trusted network because the call remains within the company's telephone network infrastructure. However, calls may be transferred from one service provider's telephone network to another service provider's telephone network in generally trusted movement. Generally, service providers are in competition with one another and therefore there is general trust in transferring a call, but not trust in sharing of subscriber information beyond a subscriber number and name from one service provider to the next without security features or other arrangements.

Advantageously, each telephone network within PSTN **10** may access a data network functioning as an extension to PSTN **10** via an Intranet. Data networks may include, for example, subscriber profiles, billing information, and preferences that are utilized by a service provider to specialize services. Transfer of information between a service provider's data network and

25 telephone network is trusted movement in sharing of information.

Further, each telephone network within PSTN **10** may access server systems external to PSTN **10** in the Internet Protocol over the Internet or an Intranet. Such external server systems may

include an enterprise server, an Internet service provider (ISP), an access service provider (ASP), a personal computer, and other computing systems that are accessible via a network. In the present embodiment, transfer of information between PSTN **10** and 5 server systems accessible via network **20** is totally untrusted and therefore may require authentication and additional security.

In the present invention, network **20** may comprise a private network, Intranet, or a public Internet Protocol network. 10 Specifically, telco application server **22**, generic application server **24**, pervasive application server **26**, and systems management server **28** represent server systems external to PSTN **10** that may be accessed by PSTN **10** over network **20**.

15 In particular, telco application server **22** preferably includes multiple telco specific service applications for providing services to calls transferred to a server external to PSTN **10**. In particular, a call may be transferred from PSTN **10** to telco application server **22** to receive at least one service 20 and then the call is transferred back to PSTN **10**. Such services may also be provided to calls within PSTN **10**, however placing such services at a third party such as telco application server **22**, is advantageous because adding services and information to 25 PSTN **10** is time consuming and costly when compared with the time and cost of adding the services through telco application server **22**.

In accord with an advantage of the present invention, as

will be further described, the identity of both the caller and the callee may be authenticated by one of telephony devices **8a-**
8n, PSTN **10**, or by telco application server **22**. By authenticating the actual identity of the person making a phone
5 call and the person receiving the phone call, rather than the identification of a device from which a call is made and received, an enhanced specialization of services to subscribers may be performed.

10 An authentication service within telco application server **22** may include identification and verification of the identity of a caller and/or callee of a particular call. Such a service may require that subscribers provide voice samples when setting up a subscription. The stored voice samples may then be compared
15 against voice samples received for a particular call in order to authenticate the identity of a current caller or callee of the particular call.

Generic application server **24** preferably accesses
20 independent server systems that provide services. For example, a messaging server, a financial server, an Internal Revenue Service (IRS) server, and database management system (DBMS) server may be accessed in HTTP via network **20**. Each of these servers may include a telco service application that requires authentication
25 of the subscriber before access is granted. For example, a financial server may provide a telco service application that allows an authenticated subscriber to access current financial records and request stock quotes from the financial server.

Pervasive application server **26** manages services for wirelessly networked devices. In particular, pervasive application server **26** preferably handles distribution of wireless packets of voice and data to wirelessly networked devices 5 utilizing a standard such as short messaging service (SMS) messaging or other 3G standards.

Systems management server **28** manages subscriber personalization via the web. In particular, systems management server **28** includes browser technology that includes a provisioning console **30** for establishing a subscriber profile and a management console **32** for managing and updating the subscriber profile. A subscriber preferably accesses the consoles of systems management server **28** via the Internet utilizing a 10 computing system, such as computing systems **34a-34n**.
15

The subscriber profile may be accessed at systems management server **28** by other external servers and PSTN **10** via network **20**. In addition, a local copy of a subscriber profile updated in 20 systems management server **28** may be stored within a particular service provider's data network or telephone network. Each service provider may specify the types of preferences and other information included within a subscriber profile.

25 In particular, a subscriber may provide a voice imprint when establishing a subscriber profile through provisioning console **30**. Other types of authentication information may also be provided including, but not limited to, a password, an eye scan, a smart card ID, and other security devices. In addition, a

subscriber may designate billing preferences, shopping preferences, buddy list preferences, and other preferences that enable specialized service to the subscriber when the subscriber's identity is authenticated from the voice imprint or 5 other identification.

Advantageously, a management agent is built into each external server to monitor the services provided by each server according to the authenticated subscriber receiving the services.

10 By monitoring service output according to subscriber, the subscriber may then be billed according to each use of a service.

15 PSTN **10** preferably includes both voice and data signaling networks that interface with network **20** via gateways. Each of the gateways acts as a switch between PSTN **10** and network **20** that may compress a signal, convert the signal into Internet Protocol (other protocol) packets, and route the packets through network **20** to the appropriate server.

20 In particular, the voice network interfaces with network **20** through media gateway **14** which supports multiple protocol gateways including, but not limited to, SIP. SIP is a signaling protocol for Internet conferencing, telephony, presence, events notification and instant messaging.

25 In addition, in particular, the data signaling network interfaces with network **20** through signaling gateway **12** which supports multiple protocol gateways including, but not limited to, parlay protocol gateways and SS7 protocol gateways. Internet servers, such as telco application server **22** may include protocol

agents that are enabled to interact with multiple protocols encapsulated in Internet Protocol packets including, but not limited to, SS7 protocol, parlay protocol, and SIP.

5 IDENTITY AUTHENTICATION AND CALL CONTROL

Looking into PSTN **10**, a telephone network typically includes multiple switches, such as central office switches **11a-11n**, that originate, terminate, or tandem calls. Central office switches **11a-11n** utilize voice trunks for transferring voice communications and signaling links for transferring signals between signaling points.

Between signaling points, one central office switch sends signaling messages to other central office switches via signaling links to setup, manage, and release voice circuits required to complete a call. In addition, between signaling points, central office switches **11a-11n** query service control points (SCPs) **15** to determine how to route a call. SCPs **15** send a response to the originating central office switch containing the routing number(s) associated with the dialed number.

SCPs **15** may be general purpose computers storing databases of call processing information. While in the present embodiment SCPs **15** are depicted locally within PSTN **10**, in alternate embodiments SCPs **15** may be part of an extended network accessible to PSTN **10** via a network.

One of the functions performed by SCPs **15** is processing calls to and from various subscribers. For example, an SCP may

store a record of the services purchased by a subscriber, such as a privacy service. When a call is made to the subscriber, the SCP provides record of the privacy service to initiate an announcement to a caller to identify themself to the subscriber 5 with the privacy service who is being called. According to an advantage of the invention, authentication of the subscriber receiving the call may be required before the privacy service is initiated for that subscriber.

10 In particular, network traffic between signaling points may be routed via a packet switch called an service transfer point (STP) **13**. STP **13** routes each incoming message to an outgoing signaling link based on routing information. Further, in particular, the signaling network may utilize an SS7 network 15 implementing SS7 protocol.

Central office switches **11a-11n** may also send voice and signaling messages to intelligent peripherals (IP) **17** via voice trunks and signaling channels. IP **17** provides enhanced 20 announcements, enhanced digit collection, and enhanced speech recognition capabilities.

According to an advantage of the present invention, the identity of a caller is authenticated according to voice 25 authentication. Voice authentication is preferably performed by first identifying a subscriber by matching the name or other identifier spoken with a subscriber name or identifier. Next, voice authentication requires verifying that the voice audio signal matches that of the identified subscriber. However, in

alternate embodiments, the identity of a subscriber may be authenticated according to passwords, eye scans, encryption, and other security devices.

5 In particular, to perform subscriber authentication of audio signals received from callers, IP **17** may include storage for subscriber specific templates or voice feature information, for use in authenticating subscribers based on speech. If a subscriber specific template is not stored on a local IP **17**, then a remote IP containing the subscriber specific template may be accessed via a network. In addition, local IP **17** may access systems management server **28** or another repository for voice imprints to access the subscriber specific template.

10 Where IP **17** authenticates the identity of a caller (e.g. the subscriber placing a call), a voice identifier (VID) representing the authenticated caller identity is transferred as a signal for identifying the caller. In addition, where IP **17** authenticates the identity of a callee (e.g. the subscriber receiving a call), 20 a reverse VID (RVID) including the callee identity is transferred as a signal for identifying the callee.

15 Advantageously, VIDs indicate through text, voice, or video the identity of a caller. For example, a callerIs name may be transferred as the identity of a caller. Alternatively, a video clip stored with the subscriber template may be transferred as the identity of a caller. Additionally, VIDs may indicate the identity of the device utilized by a caller to provide context for a call. Further, VIDs may indicate which system or systems

have authenticated the caller identity.

After a VID and/or RVID are determined by IP **17**, IP **17** and SCP **15** may communicate to designate which services are available 5 according to VID and RVID. Advantageously, by designating services according to a VID and/or RVID, subscribers are provided with services and billed for those services independent of the devices utilized by subscribers. In particular, a 1129 protocol or other protocol may be utilized to enable signal communications 10 between IP **17** and SCPs **15**. In addition, as previously described, caller authentication to determine VIDs and RVIDs may be performed by a third party, such as telco application server **22**.

An origin telephony device or destination telephony device 15 may also determine a VID and/or RVID for the caller and/or callee of a call. In particular, telephony devices **8a-8n** and call centers **16a-16n** may function as origin and designation telephony devices. Each of the telephony devices may include a database of voice templates that may be matched to authenticate the identity 20 of a caller or callee. In addition, each of the telephony devices may access a third party, such as telco application server **22**, to authenticate the identity of the caller or callee.

In either case, the telephony device transmits a VID and/or RVID with a call to PSTN **10**.

25

Telephony devices **8a-8n** may include, but are not limited to wireline devices, wireless devices, pervasive device equipped with telephony features, a network computer, a facsimile, a modem, and other devices enabled for network communication.

Advantageously, as previously described, a voice authentication functioning device may be included in each of telephony devices **8a-8n**.

5 However, in addition to authentication according to voice identification and recognition, telephony devices **8a-8n** may be equipped to receive other biometric type input. For example, telephony devices **8a-8n** include an eye print scanner, a fingerprint scanner, and other devices that detect individual human characteristics. Preferably, telephony devices **8a-8n** may receive these other types of biometric input and compare other types of biometric input with previous recorded samples to determine the identity of a caller.

15 In addition, telephony devices **8a-8n** may each incorporate a display that provides a visual output of a VID or RVID. Alternatively, such a display may be provided in a separate device connected to the line in parallel to telephones **8a-8n**. According to one advantage of the present invention, the identity 20 of the actual caller or actual callee are output to a display in association with a call. In addition, other context information about the caller including, but not limited to, the device from which the call originates or is answered, ratings for a caller or callee, and other context information may be output to a display 25 in association with a call.

Telephony devices **8a-8n** are communicatively connected to PSTN **10** via wireline, wireless, ISDN, and other communication links. Preferably, connections to telephony devices **8a-8n**

provide digital transport for two-way voice grade type telephone communications and a channel transporting signaling data messages in both directions between telephony devices **8a-8n** and PSTN **10**.

5 In addition to telephony devices **8a-8n**, advanced telephone systems, such as call centers **16a-16n**, may be communicatively connected to PSTN **10** via wireline, wireless, ISDN and other communication links. Call centers **16a-16n** may include PBX systems, hold queue systems, private network systems, and other systems that are implemented to handle distribution of calls to multiple representatives or agents.

10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185
190
195
200
205
210
215
220
225
230
235
240
245
250
255
260
265
270
275
280
285
290
295
300
305
310
315
320
325
330
335
340
345
350
355
360
365
370
375
380
385
390
395
400
405
410
415
420
425
430
435
440
445
450
455
460
465
470
475
480
485
490
495
500
505
510
515
520
525
530
535
540
545
550
555
560
565
570
575
580
585
590
595
600
605
610
615
620
625
630
635
640
645
650
655
660
665
670
675
680
685
690
695
700
705
710
715
720
725
730
735
740
745
750
755
760
765
770
775
780
785
790
795
800
805
810
815
820
825
830
835
840
845
850
855
860
865
870
875
880
885
890
895
900
905
910
915
920
925
930
935
940
945
950
955
960
965
970
975
980
985
990
995
1000
1005
1010
1015
1020
1025
1030
1035
1040
1045
1050
1055
1060
1065
1070
1075
1080
1085
1090
1095
1100
1105
1110
1115
1120
1125
1130
1135
1140
1145
1150
1155
1160
1165
1170
1175
1180
1185
1190
1195
1200
1205
1210
1215
1220
1225
1230
1235
1240
1245
1250
1255
1260
1265
1270
1275
1280
1285
1290
1295
1300
1305
1310
1315
1320
1325
1330
1335
1340
1345
1350
1355
1360
1365
1370
1375
1380
1385
1390
1395
1400
1405
1410
1415
1420
1425
1430
1435
1440
1445
1450
1455
1460
1465
1470
1475
1480
1485
1490
1495
1500
1505
1510
1515
1520
1525
1530
1535
1540
1545
1550
1555
1560
1565
1570
1575
1580
1585
1590
1595
1600
1605
1610
1615
1620
1625
1630
1635
1640
1645
1650
1655
1660
1665
1670
1675
1680
1685
1690
1695
1700
1705
1710
1715
1720
1725
1730
1735
1740
1745
1750
1755
1760
1765
1770
1775
1780
1785
1790
1795
1800
1805
1810
1815
1820
1825
1830
1835
1840
1845
1850
1855
1860
1865
1870
1875
1880
1885
1890
1895
1900
1905
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
2055
2060
2065
2070
2075
2080
2085
2090
2095
2100
2105
2110
2115
2120
2125
2130
2135
2140
2145
2150
2155
2160
2165
2170
2175
2180
2185
2190
2195
2200
2205
2210
2215
2220
2225
2230
2235
2240
2245
2250
2255
2260
2265
2270
2275
2280
2285
2290
2295
2300
2305
2310
2315
2320
2325
2330
2335
2340
2345
2350
2355
2360
2365
2370
2375
2380
2385
2390
2395
2400
2405
2410
2415
2420
2425
2430
2435
2440
2445
2450
2455
2460
2465
2470
2475
2480
2485
2490
2495
2500
2505
2510
2515
2520
2525
2530
2535
2540
2545
2550
2555
2560
2565
2570
2575
2580
2585
2590
2595
2600
2605
2610
2615
2620
2625
2630
2635
2640
2645
2650
2655
2660
2665
2670
2675
2680
2685
2690
2695
2700
2705
2710
2715
2720
2725
2730
2735
2740
2745
2750
2755
2760
2765
2770
2775
2780
2785
2790
2795
2800
2805
2810
2815
2820
2825
2830
2835
2840
2845
2850
2855
2860
2865
2870
2875
2880
2885
2890
2895
2900
2905
2910
2915
2920
2925
2930
2935
2940
2945
2950
2955
2960
2965
2970
2975
2980
2985
2990
2995
3000
3005
3010
3015
3020
3025
3030
3035
3040
3045
3050
3055
3060
3065
3070
3075
3080
3085
3090
3095
3100
3105
3110
3115
3120
3125
3130
3135
3140
3145
3150
3155
3160
3165
3170
3175
3180
3185
3190
3195
3200
3205
3210
3215
3220
3225
3230
3235
3240
3245
3250
3255
3260
3265
3270
3275
3280
3285
3290
3295
3300
3305
3310
3315
3320
3325
3330
3335
3340
3345
3350
3355
3360
3365
3370
3375
3380
3385
3390
3395
3400
3405
3410
3415
3420
3425
3430
3435
3440
3445
3450
3455
3460
3465
3470
3475
3480
3485
3490
3495
3500
3505
3510
3515
3520
3525
3530
3535
3540
3545
3550
3555
3560
3565
3570
3575
3580
3585
3590
3595
3600
3605
3610
3615
3620
3625
3630
3635
3640
3645
3650
3655
3660
3665
3670
3675
3680
3685
3690
3695
3700
3705
3710
3715
3720
3725
3730
3735
3740
3745
3750
3755
3760
3765
3770
3775
3780
3785
3790
3795
3800
3805
3810
3815
3820
3825
3830
3835
3840
3845
3850
3855
3860
3865
3870
3875
3880
3885
3890
3895
3900
3905
3910
3915
3920
3925
3930
3935
3940
3945
3950
3955
3960
3965
3970
3975
3980
3985
3990
3995
4000
4005
4010
4015
4020
4025
4030
4035
4040
4045
4050
4055
4060
4065
4070
4075
4080
4085
4090
4095
4100
4105
4110
4115
4120
4125
4130
4135
4140
4145
4150
4155
4160
4165
4170
4175
4180
4185
4190
4195
4200
4205
4210
4215
4220
4225
4230
4235
4240
4245
4250
4255
4260
4265
4270
4275
4280
4285
4290
4295
4300
4305
4310
4315
4320
4325
4330
4335
4340
4345
4350
4355
4360
4365
4370
4375
4380
4385
4390
4395
4400
4405
4410
4415
4420
4425
4430
4435
4440
4445
4450
4455
4460
4465
4470
4475
4480
4485
4490
4495
4500
4505
4510
4515
4520
4525
4530
4535
4540
4545
4550
4555
4560
4565
4570
4575
4580
4585
4590
4595
4600
4605
4610
4615
4620
4625
4630
4635
4640
4645
4650
4655
4660
4665
4670
4675
4680
4685
4690
4695
4700
4705
4710
4715
4720
4725
4730
4735
4740
4745
4750
4755
4760
4765
4770
4775
4780
4785
4790
4795
4800
4805
4810
4815
4820
4825
4830
4835
4840
4845
4850
4855
4860
4865
4870
4875
4880
4885
4890
4895
4900
4905
4910
4915
4920
4925
4930
4935
4940
4945
4950
4955
4960
4965
4970
4975
4980
4985
4990
4995
5000
5005
5010
5015
5020
5025
5030
5035
5040
5045
5050
5055
5060
5065
5070
5075
5080
5085
5090
5095
5100
5105
5110
5115
5120
5125
5130
5135
5140
5145
5150
5155
5160
5165
5170
5175
5180
5185
5190
5195
5200
5205
5210
5215
5220
5225
5230
5235
5240
5245
5250
5255
5260
5265
5270
5275
5280
5285
5290
5295
5300
5305
5310
5315
5320
5325
5330
5335
5340
5345
5350
5355
5360
5365
5370
5375
5380
5385
5390
5395
5400
5405
5410
5415
5420
5425
5430
5435
5440
5445
5450
5455
5460
5465
5470
5475
5480
5485
5490
5495
5500
5505
5510
5515
5520
5525
5530
5535
5540
5545
5550
5555
5560
5565
5570
5575
5580
5585
5590
5595
5600
5605
5610
5615
5620
5625
5630
5635
5640
5645
5650
5655
5660
5665
5670
5675
5680
5685
5690
5695
5700
5705
5710
5715
5720
5725
5730
5735
5740
5745
5750
5755
5760
5765
5770
5775
5780
5785
5790
5795
5800
5805
5810
5815
5820
5825
5830
5835
5840
5845
5850
5855
5860
5865
5870
5875
5880
5885
5890
5895
5900
5905
5910
5915
5920
5925
5930
5935
5940
5945
5950
5955
5960
5965
5970
5975
5980
5985
5990
5995
6000
6005
6010
6015
6020
6025
6030
6035
6040
6045
6050
6055
6060
6065
6070
6075
6080
6085
6090
6095
6100
6105
6110
6115
6120
6125
6130
6135
6140
6145
6150
6155
6160
6165
6170
6175
6180
6185
6190
6195
6200
6205
6210
6215
6220
6225
6230
6235
6240
6245
6250
6255
6260
6265
6270
6275
6280
6285
6290
6295
6300
6305
6310
6315
6320
6325
6330
6335
6340
6345
6350
6355
6360
6365
6370
6375
6380
6385
6390
6395
6400
6405
6410
6415
6420
6425
6430
6435
6440
6445
6450
6455
6460
6465
6470
6475
6480
6485
6490
6495
6500
6505
6510
6515
6520
6525
6530
6535
6540
6545
6550
6555
6560
6565
6570
6575
6580
6585
6590
6595
6600
6605
6610
6615
6620
6625
6630
6635
6640
6645
6650
6655
6660
6665
6670
6675
6680
6685
6690
6695
6700
6705
6710
6715
6720
6725
6730
6735
6740
6745
6750
6755
6760
6765
6770
6775
6780
6785
6790
6795
6800
6805
6810
6815
6820
6825
6830
6835
6840
6845
6850
6855
6860
6865
6870
6875
6880
6885
6890
6895
6900
6905
6910
6915
6920
6925
6930
6935
6940
6945
6950
6955
6960
6965
6970
6975
6980
6985
6990
6995
7000
7005
7010
7015
7020
7025
7030
7035
7040
7045
7050
7055
7060
7065
7070
7075
7080
7085
7090
7095
7100
7105
7110
7115
7120
7125
7130
7135
7140
7145
7150
7155
7160
7165
7170
7175
7180
7185
7190
7195
7200
7205
7210
7215
7220
7225
7230
7235
7240
7245
7250
7255
7260
7265
7270
7275
7280
7285
7290
7295
7300
7305
7310
7315
7320
7325
7330
7335
7340
7345
7350
7355
7360
7365
7370
7375
7380
7385
7390
7395
7400
7405
7410
7415
7420
7425
7430
7435
7440
7445
7450
7455
7460
7465
7470
7475
7480
7485
7490
7495
7500
7505
7510
7515
7520
7525
7530
7535
7540
7545
7550
7555
7560
7565
7570
7575
7580
7585
7590
7595
7600
7605
7610
7615
7620
7625
7630
7635
7640
7645
7650
7655
7660
7665
7670
7675
7680
7685
7690
7695
7700
7705
7710
7715
7720
7725
7730
7735
7740
7745
7750
7755
7760
7765
7770
7775
7780
7785
7790
7795
7800
7805
7810
7815
7820
7825
7830
7835
7840
7845
7850
7855
7860
7865
7870
7875
7880
7885
7890
7895
7900
7905
7910
7915
7920
7925
7930
7935
7940
7945
7950
7955
7960
7965
7970
7975
7980
7985
7990
7995
8000
8005
8010
8015
8020
8025
8030
8035
8040
8045
8050
8055
8060
8065
8070
8075
8080
8085
8090
8095
8100
8105
8110
8115
8120
8125
8130
8135
8140
8145
8150
8155
8160
8165
8170
8175
8180
8185
8190
8195
8200
8205
8210
8215
8220
8225
8230
8235
8240
8245
8250
8255
8260
8265
8270
8275
8280
8285
8290
8295
8300
8305
8310
8315
8320
8325
8330
8335
8340
8345
8350
8355
8360
8365
8370
8375
8380
8385
8390
8395
8400
8405
8410
8415
8420
8425
8430
8435
8440
8445
8450
8455
8460
8465
8470
8475
8480
8485
8490
8495
8500
8505
8510
8515
8520
8525
8530
8535
8540
8545
8550
8555
8560
8565
8570
8575
8580
8585
8590
8595
8600
8605
8610
8615
8620
8625
8630
8635
8640
8645
8650
8655
8660
8665
8670
8675
8680
8685
8690
8695
8700
8705
8710
8715
8720
8725
8730
8735
8740
8745
8750
8755
8760
8765
8770
8775
8780
8785
8790
8795
8800
8805
8810
8815
8820
8825
8830
8835
8840
8845
8850
8855
8860
8865
8870
8875
8880
8885
8890
8895
8900
8905
8910
8915
8920
8925
8930
8935
8940
8945
8950
8955
8960
8965
8970
8975
8980
8985
8990
8995
9000
9005
9010
9015
9020
9025
9030
9035
9040
9045
9050
9055
9060
9065
9070
9075
9080
9085
9090
9095
9100
9105
9110
9115
9120
9125
9130
9135
9140
9145
9150
9155
9160
9165
9170
9175
9180
9185
9190
9195
9200
9205
9210
9215
9220
9225
9230
9235
9240
9245
9250
9255
9260
9265
9270
9275
9280
9285
9290
9295
9300
9305
9310
9315
9320
9325
9330
9335
9340
9345
9350
9355
9360
9365
9370
9375
9380
9385
9390
9395
9400
9405
941

OE number assigned to that terminal pair. For a variety of reasons, a service provider may assign different telephone numbers to the one line at the same or different times. For example, a local carrier may change the telephone number because 5 a subscriber sells a house and a new subscriber moves in and receives a new number. However, the OE number for the terminals and thus the line itself remains the same.

On a normal call, a central office switch will detect an off-hook condition on a line and provide a dial tone. The switch identifies the line by the OE number. The central office switch retrieves profile information corresponding to the OE number and off-hook line. Then, the central office switch receives the dialed digits from the off-hook line terminal and routes the call. The central office switch may route the call over trunks and possibly through one or more central office switches to the central office switch that serves the called party's station or line. The switch terminating a call to a destination will also utilize profile information relating to the destination, for 20 example to forward the call if appropriate, to apply distinctive ringing, etc.

In the present invention, when a central office switch detects a pickup condition from a destination device on a line, 25 the central office switch will then determine if a VID signal is transferred from the pickup telephony device. If a VID is transferred, then a query is made to SCP 15 according to the VID for any services specified for the authenticated subscriber. Alternatively, a query may be transferred via network 20 to an

external server, such as system management server **28**, to determine the services specified for the caller. The central office switch will then receive the dialed digits from the off-hook line terminal and route the call, providing services 5 according to those preferred by the authenticated subscriber.

In addition, an RVID may be provided in the present invention to authenticate the identity of a callee receiving the call. When a call is answered, the call is transferred back to an IP or telco application server **22** to authenticate the identity of the callee answering the call.

As another alternative to dialed digits from the off-hook line terminal, a caller may utilize a voice calling function of a telephony device for indicating how the call should be routed. For example, a caller may say the name of a preferred callee. The device or IP **17** may determine a person within the caller's calling list that matches the voiced name. The matching person's digits are then utilized to route the call.

20

VID AUTHENTICATION CONTEXT

Referring now to **Figure 2**, there is illustrated a block diagram of the flow of a voice identifier authenticated by a destination device in accordance with the method, system, and program of the present invention.

As depicted, an origin device **40** is utilized to place a call via an intermediary device **42** to a destination device **44**. In

particular, origin device **40** may include a caller telephony device, as previously described. However, origin device **40** may also include a PBX, call center or other private switching system that manages multiple telephony devices. Moreover, origin device 5 **40** may include network servers, feature servers, and other systems which provide call origination. While in the present embodiment origin device **40** does not authenticate the identity of a caller, in alternate embodiments, origin device **40** may include an identity authentication feature.

10 Preferably, an identifier for origin device **40** may be transferred with a call request to intermediary device **40**. Alternatively, an identifier for origin device **40** may be determined by intermediary device **42**. The identifier may 15 indicate the type of device and the line subscriber for a device, if available. The device identifier may be transmitted to destination device **44** to provide context for a call. For example, if Jane is calling from JonIs cellular telephone, then such context may be provided to the destination device.

20 In particular, intermediary device **42** may include a PSTN switching network. However, intermediary device **42** may also include a PBX, call center or other private switching system. Moreover, intermediary device **42** may include network servers, 25 telco application servers, Websphere7 (Websphere7 is a registered trademark of International Business Machines, Inc.) servers, and other systems which provide call processing.

In the present embodiment, intermediary device **42** provides services to the caller according to the services provided to the subscriber wireline or wireless number. However, in alternate embodiments, authentication of a caller identity may be performed 5 at origin device **40** and/or intermediary device **42**, wherein a VID may be utilized to specify services available to a particular caller.

Intermediary device **42** connects origin device **40** with a destination device **44**. In particular, destination device **44** may include a callee telephony device, as previously described. However, destination device **44** may also include a PBX, call center, or other private switching system that manages telephony devices. Moreover, destination device **44** may include network 15 servers, feature servers, client side devices, and other systems which provide call receipt.

A service identification/verification (SIV) **49** feature within destination device **44** may determine the identity of a 20 caller and authenticate that identity in a VID by comparing a voice utterance made by a caller with an address book of voice samples **48** stored at destination device **44**. The voice utterance may include, for example, the callerIs name and the callerIs service provider.

25
Destination device **44** advantageously includes a display device or other output interface for output of the authenticated VID to the callee, such that the identity of the caller of an incoming call is provided to the callee. The callee may then

decide whether to speak to the caller, transfer the caller to voice mail, or end the call.

In addition to output of the caller VID at destination device **44**, the caller VID may be transferred back to intermediary device **42** and origin device **40**. The caller VID may be transferred back to origin device **40** prior to display at destination device **44**, such that the caller is able to verify that the VID is in fact the identity of the caller. In addition, the caller VID may be utilized by intermediary device **42** to specify services available to the caller.

Further, the VID may be filtered by SIV **49** prior to transfer to intermediary device **42**. In particular, a callee may store information on destination device **44** in association with the VID that the callee does not want distributed to intermediary device **42**, but would like to receive personally. Filtering the VID preferably limits the content of the VID transferred to intermediary device **42**.

In addition to the VID including a caller identity as determined at destination device **44**, additional context information received from a call may be combined with the VID. By providing a callee with the context of a call in addition to the identity of the caller, the callee may more carefully determine how to respond to a call.

A VID may be transferred in multiple protocols, including, but not limited to, Interface Definition Language (IDL). A VID

may include a range of information, where each type of information may be tagged or identified in some other manner. For example, the following tagged VID may be transmitted to represent an authenticated identity of a caller:

5

[name] Jon Smith
[device] Jane DoeIs cell phone
[location] Central Time zone
[subject] Project A
[authenticated by] Jane DoeIs cell phone

Destination device **44** may output all the information included in a VID or a selection of the information. For example, for the tagged VID described above, destination device **44** may output the following to an input/output interface associated with destination device **44**:

AIncoming call from Jon Smith, using Jane DoeIs cell phone, in reference to Project A@

20

In addition, destination device **44** may interpret the information included in a VID. For example, for the tagged VID described above, destination device **44** may interpret the location and output the following:

25

AIt is currently 4:00 PM at Jon SmithIs location@

Further, destination device **44** may perform other functions with a VID. For example, destination device **44** may translate the

VID into a particular language. In addition, destination device **44** may request additional information for a VID from a third party server.

5 With reference now to **Figure 3**, there is depicted a block diagram of the flow of a voice identifier authenticated by a third party device accessible from a destination device in accordance with the method, system, and program of the present invention.

10 As illustrated, destination device **44** may access a third party device **46** with a request for VID authentication. Third party device **46** may include a telco application server, accessible via a network, that performs caller authentication.
15 However, third party device **46** may also be a stand alone system or a server connected to a PBX, a private switching system, or a service provider switching system.

Third party device **46** may include an SIV **49** feature that
20 receives a voice utterance made by a caller at origin device **40** and authenticates an identity of a caller associated with the voice utterance by comparing the voice utterance with a voice sample database **50** stored at third party device **46**, or accessible thereto. Third party device **46** then returns a VID containing the
25 identity of the caller. Destination device **44** may add additional information received with the call to the VID to provide context for the call.

Communications between destination device **44** and third party

device **46** may be facilitated by intermediary device **42**. In addition, communications between destination device **44** and third party device **46** may be facilitated by a network, such as the Internet, an Intranet, or a private networking service.

5

SIV **49** may implement levels of security in communications with destination device **44**. For example, a secure channel utilizing a secure socket layer may be implemented. In addition, other encryption techniques may be implemented for transfer of information.

10
11
12
13
14
15
16
17
18
19
20

Alternatively, destination device **44** may access a database of voice samples stored at third party device **46**. Where destination device **44** requests voice samples from third party device **46**, destination device **40** may, for example, request a selection of voice samples for a name identified from a voice utterance. Destination device **44** then authenticates a VID for the caller.

20 In an example, a voice utterance provided by a caller may include a name and a service provider from which the caller receives service. Destination device **44** may then contact the third party service provider device **46** and request either an authentication of the voice utterance or voice samples for a name 25 identified from the voice utterance. The third party service provider advantageous stores voice samples for each customer, such that identity authentication may be performed.

Referring now to **Figure 4**, there is illustrated a flow diagram of a signal flow and processing where an origin device

authenticates a caller identity in accordance with the method, system, and program of the present invention. A standard telephone device is assumed for the origin Atel@ device in the present example. However, a similar signal flow may be applied
5 to other types of origin devices.

The caller lifts a handset creating an off-hook state in the origin device and a corresponding signal of an off-hook or change of state is transferred to a central office (step S1). In
10 response to the off-hook signal received at the central office, the central office may initiate a call and establish a register for the origin device. Next, a profile request for the line subscriber from the SCP is requested (step S2). The profile request preferably includes services available for a particular wireline or wireless number. The line subscriber profile is
15 searched for in the SCP and returned to the central office (step S3). The line subscriber profile is then loaded into the call register for specifying service available for the call (step S4) and a dial tone is extended to the origin telephone (step S5).
20 Digits for identifying a destination line are returned to the central office from the origin telephone (step S6).

Processing of the call may begin by switching the call to the central office that services the requested wireline or
25 wireless number (step S7). A call request is extended from the central office to the destination telephone (step S8).

When a destination telephone receives a call request, the destination telephone may answer the call (step S9).

Alternatively, the call may be answered by a messaging service or answering machine after a particular amount of time. The call is then transferred to the destination telephone SIV component (step S10). The SIV then initiates an identity authentication process 5 for authenticating the identity of the current caller. Further, the central office may trigger a SIV initiation to an IP at other times during a call.

First, the SIV provides a prompting instruction to the 10 caller to provide specific identifying information (step S11). It should be mentioned that although the SIV could passively monitor any speech that the caller may utter, it is advantageous to specifically prompt the caller. For example, the SIV may play an audio prompt message asking the caller to APlease say your 15 full name.© In addition, the prompt may request other identifying information such as a service provider and subject of the call, for example. In particular, the caller prompt is transferred from the origin telephone, through the intermediary central office, to the origin telephone.

20 A spoken utterance by the caller at the origin telephone provides spoken identification information that is transferred to the destination telephone, and routed to the destination telephone SIV (step S12). Analysis is performed on the spoken 25 identification information to determine a name of a caller and extract speech characteristics information (step S13). A voice template or other voice pattern information may be stored in the destination device according to a caller identity. In addition, voice template information may be stored at a third party server

accessible to the destination device. Preferably, the SIV compares the extracted speech information to the stored pattern information, to identify and authenticate the particular caller (step S14). If there is a match between the extracted speech 5 information and the stored pattern information, then a VID signal containing the authenticated identity of the caller is distributable among multiple devices (step S15). In particular, the VID is output at the destination device, such that the callee may decide whether to speak to the caller. However, the VID may 10 also be output to the origin device, such that the caller may view the identity information provided to the callee.

Once a VID is authenticated for a caller, the callee may 15 decide whether to accept the call (step S16). The callee may indicate acceptance of a call by a keypad or voice entry. If the callee does not accept the call, then the call is transferred back to the central office to be transferred to a messaging service or ended (step S17). If the callee does accept the call, then the communication channel between the caller and the callee 20 is opened at the destination device (step S18).

If there is not a match of the extracted speech information with the voice templates, then a determination is made as to whether a caller has made more than n tries to speak 25 identification information that has not matched (step S21). If the caller has not made more than n tries, then a prompt is output to the caller to provide another spoken utterance. If the caller has made more than n tries, then a denial message is output to the caller (step S22). In addition, instructions for

creating a voice template may be provided or an off-hook signal or change in state of the line without an associated VID may be sent to the central office, such that the caller is enabled to place a call utilizing the services associated with the OE of the
5 line.

According to one advantage of the present invention, where a destination device is a PBX system that manages multiple phone lines, the company controlling the PBX system may want to authenticate the identity of callers prior to allowing those callers to access employees via telephone. In another example, where the destination device is a call center that provides access automated financial accounting services, the call center may require account service subscribers to provide a voice sample that is utilized to authenticate a caller identity and determine what services the caller is allowed within the financial account services system.

While not depicted, the central office may utilize the VID
20 authenticated by the destination device to update the services provided to a call. In particular, the central office may request a caller profile from the SCP according to the VID. When the VID based caller profile is received, then the line subscriber profile in the register holding the call may be
25 supplemented or replaced by the VID based caller profile to specify the services available during the call.

It should be noted that with each transfer of a VID, the central office, the SCP, and the destination device may each

record and filter the VID. In particular, filtering the VID may require blocking all or portions of the content of the VID.

With reference now to **Figure 5**, there is depicted a flow diagram of a signal flow and processing where a third party system is accessed by a destination device to authenticate a caller identity in accordance with the method, system, and program of the present invention.

After a destination telephone answers a call (step S9), a telco service request is transferred to a network (step S29) for access to a telco application server (step S30). In particular, the request for a network connection may first transfer to a central office of a switching system that then forwards the call via a network to a telco application server. Alternatively, the destination device may also directly access a network, such as the Internet, to connect with the telco server. A secure channel may be established with the request for a network connection.

In response to receiving a telco service request, the telco application server initiates an identity authentication process for authenticating the identity of the current caller. First, an authorization service application provides a prompting instruction to the caller to provide specific identifying information (step S31). For example, the authorization service application may play an audio prompt message asking the caller to APlease say your full name.© In addition, the prompt may request other identifying information such as a service provider and subject of the call, for example. The spoken identification

information is then received at the origin device and transferred via the network to the telco application server (step S32).

Analysis is performed on the spoken identification

5 information to determine a name of a caller and extract speech characteristics information (step S33). A voice template or other voice pattern information may be accessible to the telco application server from a local or remote database management system. Preferably, the authorization service application

10 compares the extracted speech information to the stored pattern information, to identify and authenticate the particular caller.

If there is a match between the extracted speech information and the stored pattern information, then a VID signal containing the authenticated identity of the caller is then distributable among

15 multiple devices (step S35).

If there is not a match of the extracted speech information with the voice templates, then a determination is made as to whether a caller has made more than n tries to speak

20 identification information that has not matched (step 36). If the caller has not made more than n tries, then a prompt is output to the origin telephone to provide another spoken utterance. If the caller has made more than n tries, then a denial message is output to the origin telephone (step 37). In

25 addition, instructions for creating a voice template may be provided.

It is important to note that while the present invention has been described in the context of a fully functioning data

processing system, those of ordinary skill in the art will appreciate that the processes of the present invention are capable of being distributed in the form of a computer readable medium of instructions and a variety of forms and that the 5 present invention applies equally regardless of the particular type of signal bearing media actually used to carry out the distribution. Examples of computer readable media include recordable-type media, such as a floppy disk, a hard disk drive, a RAM, CD-ROMs, DVD-ROMs, and transmission-type media, such as 10 digital and analog communications links, wired or wireless communications links using transmission forms, such as, for example, radio frequency and light wave transmissions. The computer readable media may take the form of coded formats that are decoded for actual use in a particular data processing 15 system.

While the invention has been particularly shown and described with reference to a preferred embodiment, it will be understood by those skilled in the art that various changes in 20 form and detail may be made therein without departing from the spirit and scope of the invention.